Nematic membranes and shape instabilities of closed vesicles

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(Dated: May 5, 2005)

We consider the coupling between the local curvature tensor of a membrane and the local 2D nematic order parameter, deriving it from a quasi-microscopic argument. This coupling makes the nematic director aligned along the lowest curvature eigenvector in a local metric. Thus local bending of a membrane generates nematic ordering. Alternatively, the emerging nematic order leads to the shape instabilities of closed vesicles. The theory is applied to a spherical isotropic vesicle, which turns into a prolate shape with two +1 disclinations on its poles as the nematic order sets in the membrane, described within the Landau-de Gennes continuum model.

PACS numbers: 87.16.Dg, 61.30.Cz, 61.30.Dk